

Rec'd PCT/PTO 26 SEP 2005

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
21 May 2004 (21.05.2004)

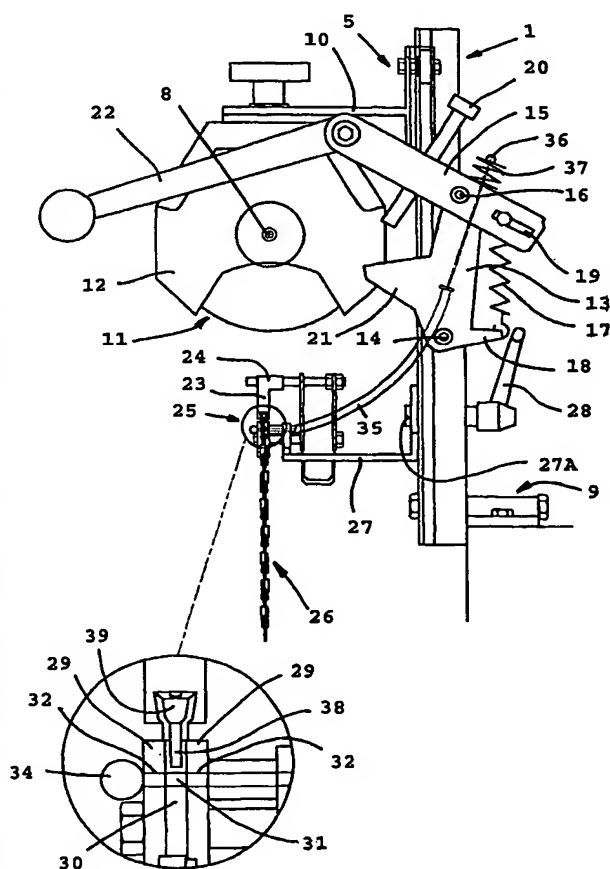
PCT

(10) International Publication Number  
**WO 2004/041466 A1**

- (51) International Patent Classification<sup>7</sup>: **B23D 63/16** (74) Agent: ERIKSSON, Kjell; Norrtälje Patentbyrå AB, P.O. Box 38, S-761 21 Norrtälje (SE).
- (21) International Application Number: PCT/SE2003/001695 (81) Designated States (*national*): AE, AG, AL, AM, AT (utility model), AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ (utility model), CZ, DE (utility model), DE, DK (utility model), DK, DM, DZ, EC, EE (utility model), EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK (utility model), SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (22) International Filing Date: 4 November 2003 (04.11.2003)
- (25) Filing Language: Swedish
- (26) Publication Language: English
- (30) Priority Data: 0203276-1 7 November 2002 (07.11.2002) SE (84) Designated States (*regional*): ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE,
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[Continued on next page]

(54) Title: METHOD AND DEVICE FOR GRINDING A SAW CHAIN



(57) Abstract: The present invention relates to a method for grinding a saw chain (26), said saw chain (26) being clamped in a position suitable for grinding, that a rotating grinding disc (11) manually is transferred from an inactive position to an active position, and that grinding of a cutter link (39) of the saw chain (26) is effected when the grinding disc (11) has assumed its active position. The invention also relates to a device for grinding a saw chain. It is significant of the invention that the transfer of the grinding disc (11) from inactive position to active position is effected by means of a rectilinear movement that is carried out by rolling contact.

WO 2004/041466 A1



SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

**Published:**

— *with international search report*

**METHOD AND DEVICE FOR GRINDING A SAW CHAIN****Technical Field of the Invention**

The present invention relates to a method for grinding a  
5 saw chain, said saw chain being clamped in a position suitable  
for grinding, that a rotating grinding disc is manually  
transferred from an inactive position to an active position,  
and that grinding of a cutter link of the saw chain is  
10 effected when the grinding disc has assumed its active  
position. The invention also relates to a device for grinding  
a saw chain. In this connection and it should be pointed out  
that the present invention only relates to a method and a  
device where the grinding disc is **manually** transferred from  
inactive position to active position.

15

**Prior Art**

In connection with devices of the type mentioned above  
the suspension frame of the grinding disc is such that the  
centre of rotation of the grinding disc moves along a circular  
20 arc when the grinding disc moves between its inactive position  
and its active position. This is an evident disadvantage that  
affects the results of the grinding in a negative way. Since  
the diameter of the grinding disc decreases when the disc is  
worn it is realised that the engagement to the cutter link is  
25 not the same when the centre of rotation of the grinding disc  
moves along a circular arc.

From US-A-4,643,050 a grinding device for grinding depth  
gauges of a saw chain is previously known. A grinding disc  
with an adherent motor is pivotable around an axis, i.e. the  
30 grinding disc moves along a circular arc in connection with  
the relative movement between the grinding disc and the depth  
gauge that is to be ground. In order to adjust the level of  
the grinding disc relative to the depth gauge that is to be  
ground a rectilinear, vertical displacement of the grinding  
35 disc is effected by means of a sliding means.

In the known devices for grinding it is also common that  
the saw chain is clamped in position manually in a separate  
operation before the grinding disc is brought to move from its  
inactive position to its active position.

## **Objects and Features of the Invention**

A primary object of the present invention is to define a method of the type mentioned above, where the grinding disc engages the cutter link in principally an identical way, regardless how much the grinding disc has been worn, the diameter of the grinding disc being decreased by the wear.

Still an object of the present invention is to automatize the clamping of the saw chain.

At least the primary object of the present invention is realised by means of a method and a device that has been given the features of the appending independent claims. Preferred embodiments of the invention are defined in the dependent claims.

## **Brief Description of the Drawings**

Below an embodiment of the invention will be described, reference being made to the accompanying drawings, where:

Figure 1 shows a view of a device according to the present invention, a grinding disc being in an inactive position, said grinding disc being part of the device;

Figure 1A shows an enlarged detail of figure 1;

Figure 2 shows a top view of a profile that constitutes a part of the device and the portion of the device that cooperates with the profile;

Figure 3 shows a side view of a portion of the profile and the portion of the device that cooperates with the profile;

Figure 4 shows a view of the device according to the present invention where the grinding disc is in active position; and

Figure 4A shows an enlarged detail of figure 4.

## **Detailed Description of a Preferred Embodiment of the Invention**

The device for grinding saw chains, shown in figures 1-3, comprises a guiding means in the shape of an elongated guide 1 that in the shown embodiment constitutes a hollow square profile, preferably an ejection moulded aluminium

profile. The guide 1 has two external grooves 3, located opposite to each other. The device further comprises a carriage 5 and four ball bearings 7 that are rotatably mounted on the carriage 5 and in pairs each received in a groove 3 of the guide 1. This arrangement brings about that the carriage 5 is rectilinearly displaceable along the guide 1 in the longitudinal direction of the guide 1, the displacement being carried out with a low roll resistance due to the cooperation between the ball bearings 7 and the grooves 3.

10 The device according to the invention also comprises an attachment 9 that is permanently connected to the guide 1. By means of the attachment 9 the device according to the present invention may be mounted on a base, e.g. a work table or the like, said mounting preferably being effected by having the attachment fixed to the base by means of bolts or the like.

15 The carriage 5 has a first bracket 10 that projects sideways from the carriage 5 and supports a grinding disc 11 of the device, said grinding disc 11 being rotated by a motor (not shown). The centre of rotation of the grinding disc 11 is designated by 8 and the grinding disc 11 is to a major part surrounded by an enclosure 12 that gives access only to a lower part of the grinding disc 11, i.e. the portion that engages a cutter link of the saw chain that is to be ground. This will be described more in detail below.

25 The device according to the invention also comprises a displacement mechanism that displaces the carriage 5, including the first bracket 10 and the grinding discs 11, along the guide 1. This displacement mechanism comprises a first link 13 that via a first hinge 14 is pivotally attached to the guide 1. A second link 15 of the displacement mechanism is connected to the first link 13 by means of a second hinge 16. This means that the second link 15 is pivotable relative to the first link 13. A tension spring 17 extends between a first projection 18 of the first link 13 and an elongated opening 19 of the second link 15, said opening 19 being located in the area of one end of the second link 15. The function of the tension spring 17 will be described below. An adjusting screw 20 is also attached to the second link 15, said adjusting screw 20 having an extension on both sides of

the second link 15. The adjusting screw 20 may also be displaced relative to the second link 15, which means that the degree of extension on both sides of a second link 15 may be varied. The free end of the adjusting screw 20 is intended to  
5 cooperate with a second projection 21 of the first link 13.

The end of the second link 15 that faces away from the opening 19 is connected to the first bracket 10. A control arm 22 projects from this end of the second link 15, said control arm 22 extending sideways a distance beyond the  
10 grinding disc 11 with its enclosure 12. This brings about that the control arm 22 is easily accessible to the operator of the device according to the present invention. As will be described more in detail below the carriage 5 may be displaced along the guide 1 by manual actuation of the control arm 22.

15 The device according to the present invention also comprises a clamping means 25 for the saw chain 26 that is to be ground. The clamping means 25 comprises a second bracket 27, by which the clamping means 25 is attached to the guide 1, the second bracket 27 being pivotally mounted to the guide 1  
20 by means of a hinge 27A. The second bracket 27 may be clamped in a fixed position relative to the guide 1 by means of a clamping arm 28. The clamping means 25 also comprises an adjustable abutment 23 that is supported by a supporting means 24 that in its turn is attached to the second bracket 27. The  
25 adjustable abutment 23 is of a conventional design that represents prior art in the present case.

The clamping means 25 is disclosed more in detail in figure 1A and figure 4A, and hence reference is primarily made to those figures in the description below of the clamping  
30 means 25. As is evident from figure 1A and figure 4A the clamping means 25 comprises two chain rulers 29 that define a variable space 30 between the upper longitudinal edges of the chain rulers 29. This may for instance be achieved by having the chain rulers 29 rigidly connected to each other in their  
35 lower parts and the resilient material, e.g. spring steel, in the chain rulers 29 renders a variable space 30 between the upper longitudinal edges of the chain rulers 29. In order to achieve a controlled variation of the space 30 between the upper longitudinal edges of the chain rulers 29 a wire 31

extends through the space 30 and also through the chain rulers 29. This means that the chain rulers 29 have holes 32 for the wire 31, said holes 32 being located directly opposite to each other. At its free end the wire 31 is equipped with a first wire nipple 34. After having passed through the chain rulers 29 the wire 31 further extends inside a wire casing 35 and the end of the wire 31 that faces away from the clamping means 25 is fastened in the second link 15, said fastening being effected by means of a second wire nipple 36 and a pressure spring 37. This is only schematically shown in figures 1 and 4 but the person skilled in the art realises that there must be an abutment, e.g. in the shape of a washer, for the second wire nipple 36 and that the abutment cooperates with the pressure spring 37.

15       The device described above functions in the following way. Figure 1 symbolises an inactive position of the device according to the present invention while figure 4 symbolises an active position. When a saw chain 26 is to be ground said chain 26 is mounted in the clamping means 25, see figure 1A, and a drive link 38 of the saw chain 26 is mounted in the space 30 between the chain rulers 29 and an adjustment is also effected of the cutter link 39 that is to be ground. In connection therewith the above described adjustable abutment 23 is used. As is evident from figure 1A no contact is established in this phase between the drive link 38 and the chain rulers 29. In order to effect grinding of the positioned cutter link 39 the rotation of the grinding disc 11 is started, the direction of rotation being marked by the arrow 40 in figure 4. Then the operator grips the control handle 22 and the operator pulls the control handle 22 downwards. In connection therewith the second link 15 will pivot around the second hinge 16 and the carriage 5 will move rectilinearly downwards along the guide 1. In connection therewith also the centre of rotation 8 of the grinding disc 11 will move rectilinear along the guide 1. This downwards directed movement is part of the working movement of the grinding disc 11, said movement also comprising a movement upwards that returns the grinding disc 11 to its inactive position. When the second link 15 is pivoted around the

second hinge 16, in connection with the movement downwards of the carriage 5, the tension spring 17 will be prolonged, i.e. the tension spring 17 counteracts the movement downwards of the carriage 5. In connection with the pivoting of the second link 15 a compression of the pressure spring 37 will occur and the wire 31 will be subjected to a tensile force that is directed from the clamping means 25 towards the second link 15. In connection therewith the wire 31 will urge the chain rulers 29 to abutment against the drive link 38 of the saw chain 26, and hence the drive link 38 is clamped in position. During the continued displacement downwards of the control handle 22 via the operator, the grinding disc 11 will enter into engagement with the cutter link 39 and grinding is effected of said cutter link 39. This is indicated in figure 4A by a ray of sparks 41. In order to prevent that the grinding disc 11 moves too far downwards the free end of the adjusting screw 20 will abut the second projection 21, which prevents the carriage 5, with the grinding disc 11, to move further downwards. In this connection it should be pointed out that the displacement of the wire 31 that the pivoting of the second link 15 brings about is adjusted in such a way that the clamping of the drive link 38 is effected **before** the grinding disc 11 enters into engagement with the cutter link 39.

When the grinding of the cutter link 39 has been completed the operator releases the control handle 22 and the device according to the present invention automatically returns to an inactive position. This is achieved since both the tension spring 17 and the pressure spring 37 strive to elevate the end of the second link 15 that supports the first bracket 10. During the final phase of this return movement the force in the wire 31 will in principle cease and the engagement of the chain rulers 29 with the drive link 38 will likewise cease, i.e. the position shown in figure 1A will again be present. A new cutter link 39 to be ground is now fed and in the shown embodiment this is effected manually by having the operator to bring the saw chain 26 forward a certain distance that is defined by the abutment 23. Then the method described above is cyclically repeated.



To sum up the device according to the present invention guarantees that the centre of rotation of the grinding disc 11 moves rectilinear along the guide 1. This is beneficial as regards the engagement of the grinding disc 11 with the cutting edge of the cutter link that is to be ground.

In reality the grinding disc 11 is not located in the plane of the paper in figures 1 and 4 since the cutting edge of the cutter link that is to be ground is not located in the plane of the paper. However, this is of minor importance in connection with the present invention.

### **Feasible Modifications of the Invention**

In the embodiment described above the guide 1 constitutes a square profile, preferably of aluminium, and a number of ball bearings 7 are received in grooves 3 in the profile of aluminium. However, within the scope of the present invention it is also feasible that the guide has a different cross sectional shape although the movement of the carriage along the guide must be rectilinear.

In the embodiment described above four ball bearings 7 are used as bearing means for the carriage 5 when said carriage 5 is displaced relative to the guide 1. However, it is not absolutely necessary to use ball bearings 7 or other roller bearings as bearing means. Within the scope of the present invention other rotatable means are feasible if said means bring about a rolling contact between the carriage 5 and the guide 1. In exemplifying and non-restricting purpose rotatable wheels may be mentioned and said wheels must not necessarily be journalled by means of rolling bearings.

**Claims**

1. Method for grinding a saw chain (26), said saw chain (26) being clamped in a position suitable for grinding, that a  
5 rotating grinding disc (11) manually is transferred from an inactive position to an active position, and that grinding of a cutter link (39) of the saw chain (26) is effected when the grinding disc (11) has assumed its active position, the transfer of the grinding disc (11) from inactive position to  
10 active position is effected by means of a rectilinear movement of the centre of rotation (8) of the grinding disc (11),  
c h a r a c t e r i z e d in that the rectilinear movement is carried out by rolling contact between a supporting means (5) and a guide (1).
- 15 2. Method according to claim 1, c h a r a c t e r i z e d in that the clamping of the chain (26) is effected before the grinding disc (11) has assumed its active position.
- 20 3. Method according to claim 1 or 2,  
c h a r a c t e r i z e d in that the manual transfer of the grinding disc (11) from inactive to active position automatically generates a clamping of the saw chain (26).
- 25 4. Device for grinding a saw chain, said device comprising means (25) for clamping the saw chain (26) in a position suitable for grinding, a rotatable grinding disc (11) and means for manually transferring the grinding disc (11) from an inactive position to an active position, where grinding of a  
30 cutter link (39) of the saw chain (26) is performed, the device further comprising a guide (1), a carriage (5) displaceable along the guide (1), said carriage (5) supporting the grinding disc (11), the cooperating means between the guide (1) and the carriage (5) being designed in such a way  
35 that the carriage (5) moves rectilinear along the guide (1),  
c h a r a c t e r i z e d in that rotatable means (7) are provided to abut the guide (1) in order to establish a rolling contact when the carriage (5) is displaced relative to the guide (1).

5. Device according to claim 4, c h a r a c t e r i z e d in that the guide (1) is equipped with external grooves (3) on opposite sides of the guide (1), and that the rotatable means (7) are received in the grooves (3).

6. Device according to claim 5, c h a r a c t e r i z e d in that the rotatable means constitute ball bearings (7).

7. Device according to any of the claims 4-6,

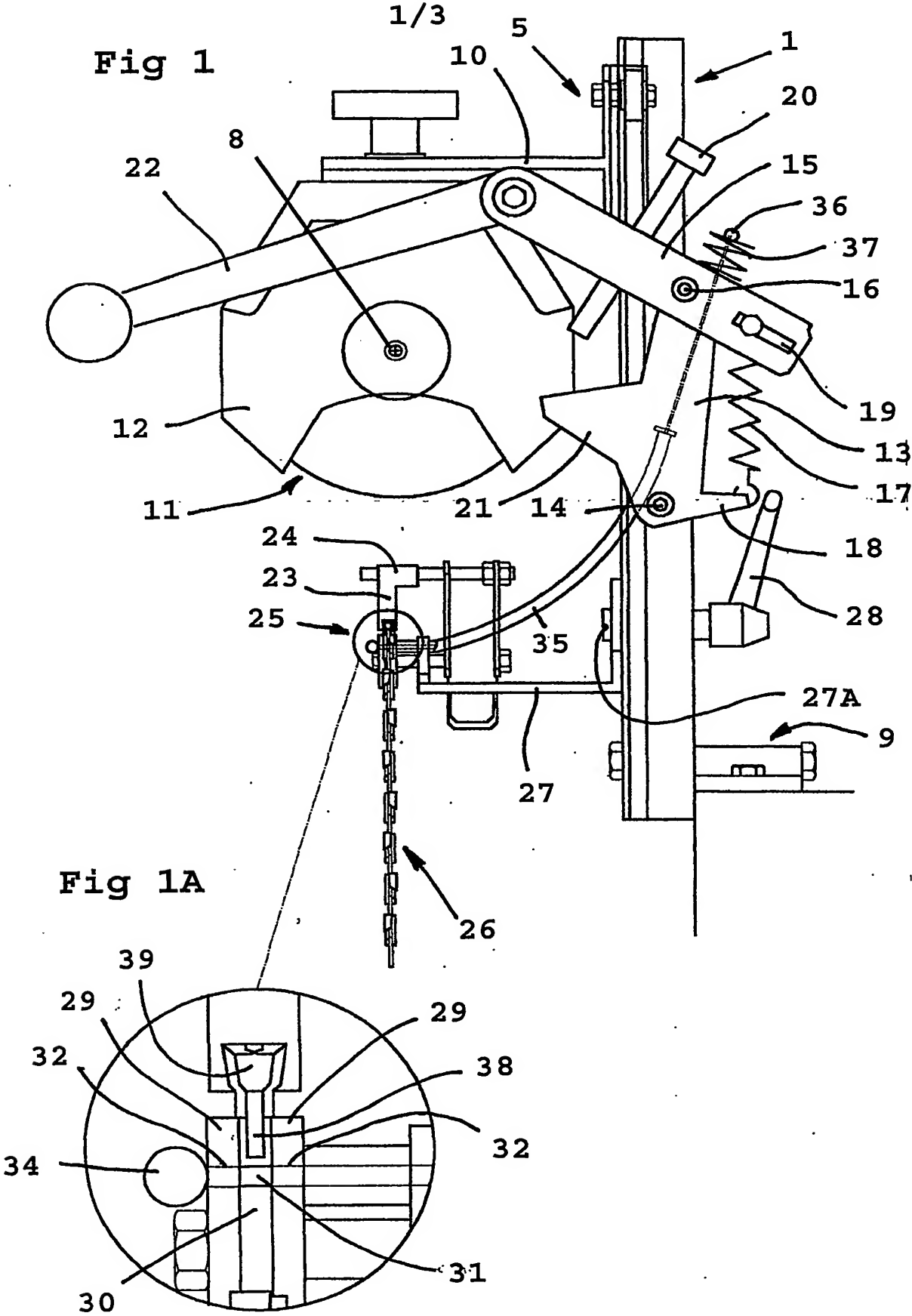
c h a r a c t e r i z e d in that the means for manually transferring the grinding disc (11) from an inactive position to an active position comprise a link system (13, 15) that is pivotally connected to the guide (1), and a control handle (22) that is intended to be manually activated by the operator.

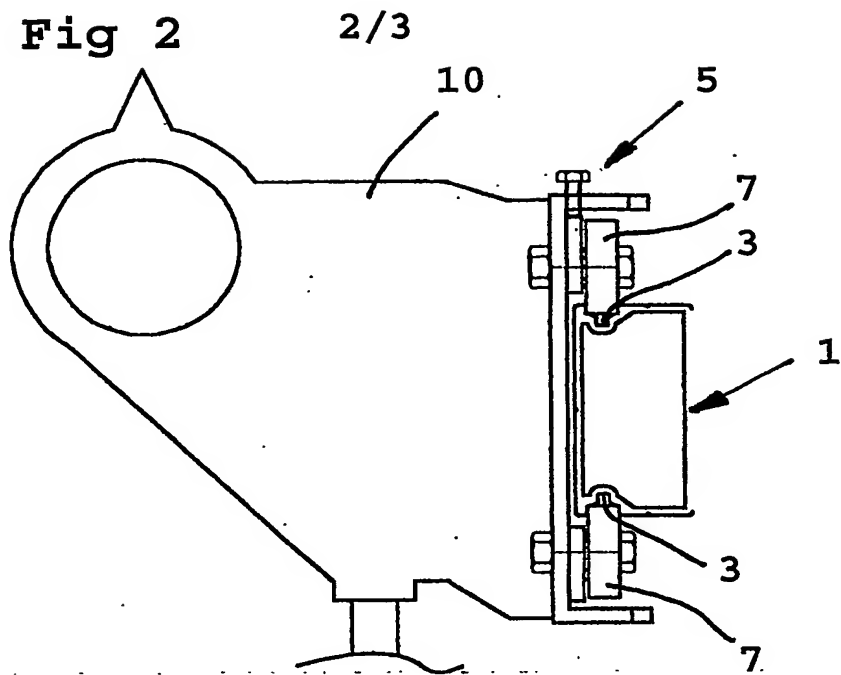
8. Device according to any of the claims 4-7,

c h a r a c t e r i z e d in that the means (25) for clamping the saw chain (26) comprise a wire (31) that is arranged in such a way that when the wire (31) is subjected to a force in a predetermined direction along the wire (31) two chain rulers (29) of the clamping means are urged towards each other thereby effecting a clamping of a drive link (38) of the saw chain (26) between the chain rulers (29).

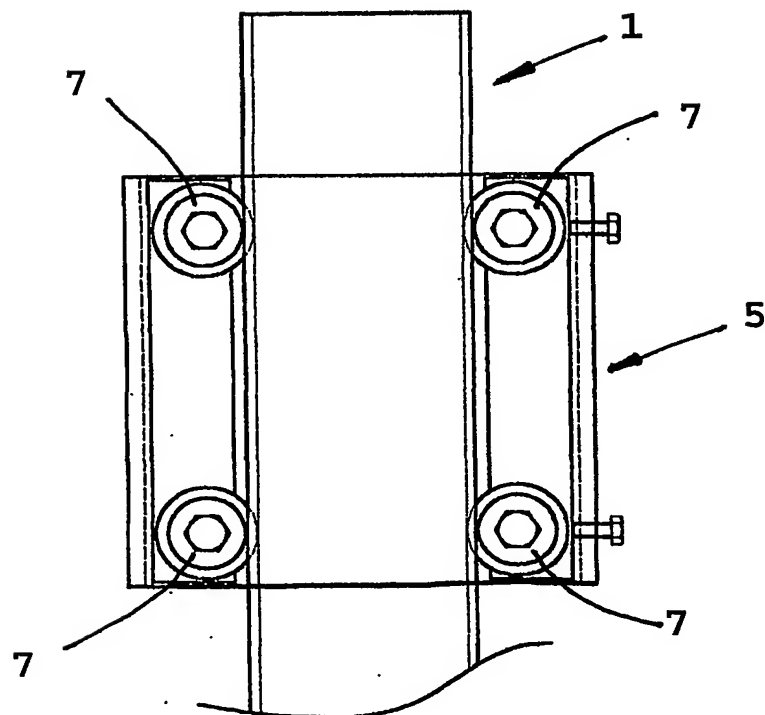
9. Device according to claim 8, c h a r a c t e r i z e d in that an abutment (34) is provided at the end of the wire (31) that is located adjacent to the chain rulers (29), that the wire (31) extends through the chain rulers (29), and that the wire (31) is connected to a second link (15) that is part of the means for transferring the grinding disc (11) from inactive to active position.

10. Device according to claim 9, c h a r a c t e r i z e d in that the wire (31) is resiliently connected to the second link (15), via a pressure spring (37).

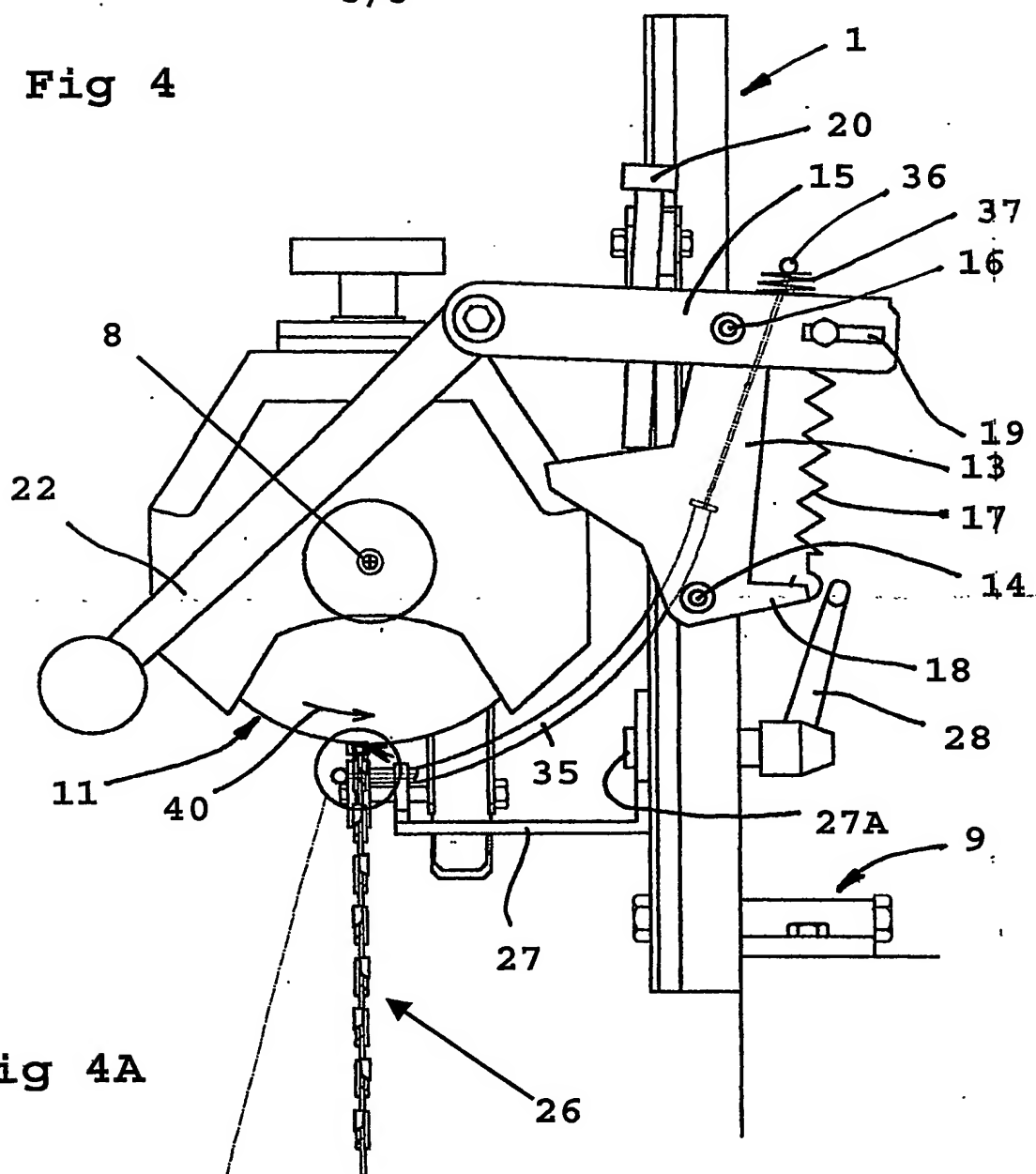




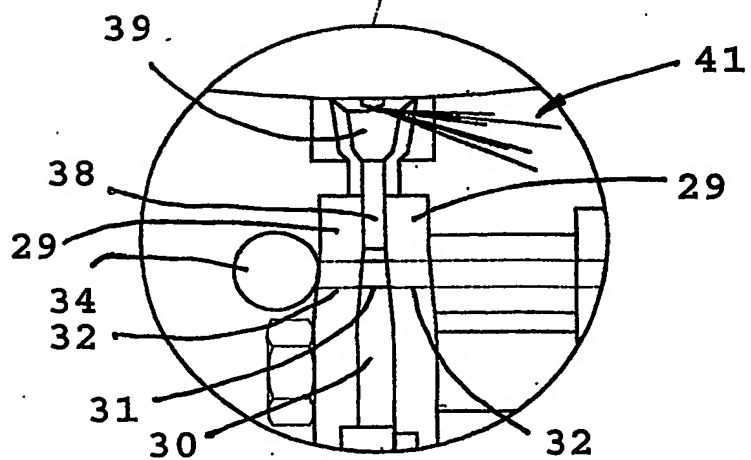
**Fig 3**



**Fig 4**



**Fig 4A**



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 2003/001695

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B23D 63/16

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B23D, B24B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages      | Relevant to claim No. |
|-----------|---|-----------------------|
| A         | DE 803579 C (JOHANN BALES), 8 July 1949<br>(08.07.1949), figure 3<br>--                 | 1,4                   |
| A         | DE 7224768 U1 (EIBEN, MARTIN), 2 November 1972<br>(02.11.1972), figure 1, claim 1<br>-- | 1,4                   |
| A         | FR 2586952 A1 (BEAU GUY), 13 March 1987<br>(13.03.1987), figure 1<br>--                 | 1,4                   |
| A         | US 2811874 A (P. RETHORET), 5 November 1957<br>(05.11.1957), figure 2<br>--             | 1,4                   |

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

\* Special categories of cited documents:

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Date of the actual completion of the international search

21 January 2004

Date of mailing of the international search report

09-02-2004

Name and mailing address of the ISA/

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 2003/001695

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages   | Relevant to claim No. |
|-----------|--|-----------------------|
| A         | US 3020783 A (E.H. HILL), 13 February 1962<br>(13.02.1962), figure 1<br><br>--   | 1,4                   |
| A         | US 4643050 A (E. RAY SILVEY), 17 February 1987<br>(17.02.1987), column 6, line 22 - line 36;<br>column 7, line 12 - line 50; column 12,<br>line 53 - line 68, figures 1,2,5,13<br><br>-- | 1,4                   |
| A         | US 4463630 A (JOHN P. TURNER), 7 August 1984<br>(07.08.1984), figures 5,7<br><br>--  | 1,4                   |
| A         | US 5031482 A (JAMES E. SHEPHERD), 16 July 1991<br>(16.07.1991), figure 2<br><br>--   | 1,4                   |
| A         | US 2002/0078796 A (ERNEST W. BROWN), 27 June 2002<br>(27.06.2002), figures 10A-11<br><br>--<br>-----   | 1,4                   |



# INTERNATIONAL SEARCH REPORT

Information on patent family members

24/12/2003

International application No.

PCT/SE 2003/001695

|    |              |    |            |      |             |            |
|----|--------------|----|------------|------|-------------|------------|
| DE | 803579       | C  | 08/07/1949 | NONE |             |            |
| DE | 7224768      | U1 | 02/11/1972 | NONE |             |            |
| FR | 2586952      | A1 | 13/03/1987 | NONE |             |            |
| US | 2811874      | A  | 05/11/1957 | NONE |             |            |
| US | 3020783      | A  | 13/02/1962 | NONE |             |            |
| US | 4643050      | A  | 17/02/1987 | US   | 4522087 A   | 11/06/1985 |
| US | 4463630      | A  | 07/08/1984 | AU   | 7967982 A   | 12/08/1982 |
|    |              |    |            | CA   | 1192749 A   | 03/09/1985 |
|    |              |    |            | DE   | 3261563 D   | 00/00/0000 |
|    |              |    |            | EP   | 0058012 A,B | 18/08/1982 |
| US | 5031482      | A  | 16/07/1991 | NONE |             |            |
| US | 2002/0078796 | A  | 27/06/2002 | NONE |             |            |